

WATER QUALITY, THE ENVIRONMENT AND OTHER CONSIDERATIONS

Water supply decisions can impact water quality, the environment, recreation, downstream water users and many other aspects of society. Water planners and managers need to be aware of these impacts and develop plans and strategies that fully consider them in order to make effective decisions.

WATER QUALITY

The Utah Water Quality Board and Division of Water Quality, and the Utah Drinking Water Board and Division of Drinking Water are responsible for the protection, planning and management of water quality in the state of Utah.

Water Quality Concerns in the Bear River Basin

Although there are portions of Box Elder County and West Cache Valley where ground water quality is relatively poor, much of the ground water in the basin is of good quality, and suitable for potable use with little or no treatment. Essentially all of the municipal, industrial, and domestic water in the basin comes from high-quality ground water sources. Between 1997 and 1999 the Utah Division of Water Quality analyzed the general chemistry and nutrients for 163 wells in Cache Valley. The concentrations of total dissolved solids ranged from 178 to 1,758 mg/l, averaging 393 mg/l valley wide. Nitrate concentrations in Cache Valley's principal aquifer

ranged from less than .02 to 35.77 mg/l. Seven of the 163 wells yielded water samples that exceeded the ground water quality standard of 10 mg/l for nitrate. High nitrate levels could be attributed to contamination from septic tank systems, feed lots and/or fertilizer.¹

The quality of surface water varies through a wide range due to natural effects and human activity. In the upper basin, where the Bear River enters Utah from Wyoming, water quality is considered good. Water temperatures are low, as are TDS (total dissolved solids), alkalinity, hardness and sulfates. But the quality deteriorates as the river flows downstream. Return flow from irrigated land, sediment, animal wastes, municipal and industrial wastewater, natural saline springs, agricultural chemicals, and increasing water temperatures all



Cutler Reservoir with its adjacent wetlands in the center of Cache Valley

combine to cause water quality problems in the lower basin. In general, each tributary stream shows a similar pattern of downstream deterioration, although some are much better than others.

In the lower Bear River Basin, water quality problems arise primarily from high phosphorus and total suspended sediment concentrations. In particular, dissolved phosphorous contributes to the eutrophication of existing reservoirs. Eutrophication causes diminished recreational and fishery benefits, and the algae produced in a eutrophic reservoir also greatly increase the cost of treatment for municipal use. Other impacts on fisheries arise when state water quality standards for dissolved oxygen and ammonia are not met. This is especially true in the Spring Creek portion of the Little Bear River drainage. High sediment loads in the Cub River and the mainstream of the Bear River also restrict fisheries. Violations of coliform criteria have occurred throughout the basin but were most severe in the Spring Creek subdrainage and indicate a potential public health problem.

Total Maximum Daily Load Program

The Federal Clean Water Act of 1972 directs each state to establish water quality standards to protect beneficial uses of surface and ground water resources. The Act also requires states to monitor water quality to assess achievements of these standards. Where water quality is found to be impaired, each state must then establish a total maximum daily load (TMDL) for each pollutant that contributes to the impairment. A TMDL sets limits on pollution sources and outlines how these limits will be met through implementation of best available technologies for point sources and best management practices for non-point sources.

A TMDL is a calculation of the maximum amount of a pollutant that a water-body can receive and still meet water quality standards for its designated beneficial use. In other words, a TMDL is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The calculation includes a margin of safety to ensure that the water-body can be used for the purposes the state has designated. The calculation also accounts for seasonable variation in water quality. The Clean Water Act, Section 303,

establishes the criteria for setting water quality standards and the TMDL programs.

The state is responsible to set water quality standards for each of its water-bodies (creek, river, pond, lake, reservoir, etc.) by identifying the uses associated with it. Examples of designated uses are: drinking water supply, contact recreation (swimming) and aquatic life support (fishing). The state then uses scientific criteria to establish water quality standards for that water-body based upon its designated use. An impaired water-body is one which has had a measured pollutant exceeding the water quality standard associated with the designated use. The current goal is to establish TMDL's for all of the state's impaired water-bodies by 2015.

The Division of Water Quality is responsible for implementing the TMDL programs in Utah. In cooperation with other state, federal and local stakeholders the Division of Water Quality has contracted with the Bear River RC&D and the Bear River Water Conservancy District to develop and implement the TMDL program for the Bear River Basin.

A Bear River Tri-State Water Quality Task Force has been created and includes Division of Water Quality personnel from each of the three states through which the Bear River passes. The primary function of this task force is to improve water quality in the Bear River and its tributaries. From its creation, one of the task force's primary goals has been to build consistency in water quality standards across state lines. The task force provides a valuable forum for coordinating Utah, Idaho and Wyoming's individual TMDL efforts to insure that the final product is consistent across state lines.

Table 19 provides a list of the water-bodies in the Bear River Basin that have been identified as impaired in the state's assessment report issued by the Utah Division of Water Quality. Throughout the drainage, including the Malad River sub-drainage, manure management is a critical issue. Runoff from fields spread with manure during the winter and direct runoff from feedlots are serious problems. Point sources also contribute substantially to nutrient loadings. Sediment problems arise from exposed banks, irrigation return flows and severely degraded riparian areas. The resulting high phosphorus loads and reduced dissolved oxygen counts are the most common pollutant problems in the Bear River Basin.

TABLE 19
Impaired Waterbodies in the Bear River Basin
 (Impaired use class in bold)

Waterbody	Pollution Parameter	Use Class
Bear River & tributaries From Cutler Reservoir to the Great Salt Lake	Total Phosphorus	2B, 3B, 3D, 4
Bear River from Utah/Wyoming border to Utah/Wyoming border	Dissolved oxygen	2B, 3A, 4
Saleratus Creek & tributaries from confluence with Woodruff Creek to headwaters	TDS, Temperature, Dissolved oxygen	2B, 3A, 4
Spring Creek from confluence with Little Bear River to headwaters	Fecal coliform, Ammonia, Temperature, Total Phosphorus Dissolved oxygen	2B, 3A, 3D, 4
Hyrum Reservoir	Total Phosphorus Dissolved oxygen	2A, 2B, 3A, 4
Newton Reservoir	Total Phosphorus Dissolved oxygen	2B, 3A, 4
Porcupine Reservoir	Temperature	2B, 3A, 4
Tony Grove Lake	Dissolved oxygen	2B, 3A, 4
Beneficial Use Classifications for Water In The State of Utah		
Class 1	Protected for use as a raw water source for domestic water	
	Protected for Recreational use and aesthetics	
Class 2	Class 2A – Protected for primary contact recreation such as swimming. Class 2B – Protected for secondary contact recreation such as boating, wading, or similar uses.	
	Protected for use by aquatic wildlife	
Class 3	Class 3A – Protected for cold water species of game fish and other aquatic life. Class 3B – Protected for warm water species of game fish and other aquatic life Class 3C – Protected for non-game fish and other aquatic life Class 3D – Protected for waterfowl, shorebirds, and other water-oriented wildlife.	
Class 4	Protected for agricultural uses including irrigation of crops and stockwatering.	
Class 5	The Great Salt Lake. Protected for primary and secondary contact recreation, aquatic wildlife and mineral extraction	

It is predicted that with a medium to high level of remediation effort, phosphorus loads can be reduced substantially, and the TMDL targets could be met in the Bear River.²

Preservation and Restoration of Riparian and Flood Plain Corridors

Some of the basin's riparian zones adjacent to streams and rivers have been impacted by construction, stream bank modification or channelization as a result of urban growth and agricultural practices. Riparian zones and flood plains need to be preserved and protected because they represent important habitat for wildlife, help improve water quality and buffer the population from flooding.

Historically, impacts to the main stem of the Bear River from urban growth have been relatively insignificant. This is because, with the exception of Evanston, Wyoming in the upper portion of the basin, there are no urban settings directly on the Bear River. A few of the Bear River's tributaries, however, have experienced impacts associated with urban growth and will undoubtedly experience more impacts in the future. Most notable of these is the Logan River, which flows through Logan city. Also, the Little Bear River (near Hyrum) and Summit Creek (near Smithfield) have the potential for urban growth to impact riparian and flood plain corridors. In Box Elder County, growth around Bear River City and Corinne are also areas of concern. In these areas it will be important for county and city planners to insure that urban growth does not

negatively impact the riparian and flood plain corridors.

Within the Bear River Basin, some cattle management practices have had a significant impact upon riparian lands. In some areas inadequate fencing has allowed cattle direct access to the stream. This practice has resulted in trampled and degraded stream banks and adjacent riparian zones. An increased awareness of this problem has resulted in several fencing and re-vegetation projects with very favorable results. There is still room, however, for further water quality improvements through fencing and other cattle management practices.

Storm Water Runoff

In urban areas, storm water runoff is a water quality problem. As the storm water and snow-melt runs off streets, parking lots, driveways and industrial areas, the water picks up salt, gasoline, oil and residue of numerous other harmful chemicals and pollutants. This water then flows into receiving waters without treatment. In some cases, these flows are detained for a brief period in a retention basin whose primary function is to attenuate the flood effects. Recent EPA regulations require many communities to detain and address pollutants in this water.

In rural settings, as growth occurs, agriculture canals are often used to convey storm water runoff. This can be a financial boon for some communities faced with the burden of developing infrastructure to accommodate storm water runoff. However, serious potential flooding problems can result from this situation. Canals are managed to deliver agricultural water. Consequently, it is possible for an unexpected storm to occur while the canal is full of water. This can result in flooding and even a possible breach of the canal creating even more significant flooding and a potential liability situation for the canal owner, the municipality or other local governments involved.

Discharge Permitting

Discharge of storm water runoff from industrial and urban landscapes into streams and rivers is a significant point source of pollution. Runoff and erosion from construction sites is also a contributor to this problem. To address this concern the U.S.



Stockwater pond in Box Elder County

Environmental Protection Agency (EPA) has initiated a two-phase process for implementation of storm water management regulations. During the first phase of the process, most industries, as well as cities with more than 100,000 people, were required to obtain storm water discharge permits. The second phase of the storm water regulations went into effect in the year 2003 and requires many smaller communities to seek a storm water discharge permit. Under the second phase of storm water regulations, requirement for a storm water discharge permits will not be based solely on community size, but instead on a complex matrix of parameters which will include the sensitivity of the receiving waters and the potential downstream water uses.

The Utah Division of Water Quality is working closely with affected communities to help them comply with these new regulations. The communities in the Bear River Basin that will be required to obtain storm water discharge permits are Brigham City, Hyde Park, Logan, Millville, Nibley, North Logan, River Heights, Smithfield and Providence.

Nutrient-Loading

Nutrient over-enrichment continues to be one of the leading causes of water quality problems in the Bear River Basin. Although these nutrients (nitrogen and phosphorus) are essential to the health of aquatic ecosystems, excessive nutrients can result in the growth of aquatic plants and algae, leading to oxygen depletion, increased fish and macro-

invertebrate mortality, and other water quality and habitat impairments.

The Bear River's water quality suffers primarily from high phosphorus and high sediment loads. The sediment load is mentioned here because one of the potential sources of phosphorus in the basin is the erosion of soils with high phosphorus content. It is believed that stabilizing stream banks and reducing erosion in the basin can have a positive impact in reducing the overall phosphorus load. The primary causes of high phosphorus loads, however, are believed to be wastewater treatment plant effluent, return flows from agriculture (particularly cattle waste runoff from feedlots and pasturelands) and runoff from heavily fertilized lawns and landscapes. Much of the efforts resulting from the TMDL process will be directed at reducing the phosphorus loads from these sources.

Concentrated Animal Feedlot Operations

Another concern receiving national and local attention is the impact which animal feedlot operations have on water quality. These operations, where large numbers of animals are grown for meat, milk or egg production can increase the biological waste loads introduced into rivers, lakes, and surface or ground water reservoirs. Animal manure contains nutrients, pathogens and salts. Because of the water quality problems created by animal feedlot operations and the relative lack of stringent regulations to control the majority of these operations, the EPA and the U.S. Department of Agriculture and Food recently developed a joint national regulation strategy.

The Utah Division of Water Quality, working together with the Utah Farm Bureau Federation, Utah Association of Conservation Districts, Dairy Association, Cattleman's Association, wool growers, and representatives from the turkey, poultry and hog industries, prepared a Utah Animal Feeding Operation and Concentrated Animal Feeding Operation strategy that will satisfy the EPA's requirements. The Utah strategy has three primary goals: (1) to restore and protect the quality of our water for beneficial uses, (2) to maintain a viable and sustainable agricultural industry, and (3) to keep the decision making process on these issues at the state and local level.

Utah's strategy calls for a commodity-group assessment of all livestock operations. Following this assessment, a general permit will be issued covering all CAFOs with 1,000 animal units or more or smaller facilities with significant water pollution problems. The strategy provides a five-year window for facilities to make voluntary improvements. After this "grace" period, the initial focus of more stringent regulatory action will be directed toward those facilities located within priority watersheds with identified water quality problems.²

Septic Tank Densities

In the rural areas of the basin, where advanced wastewater treatment systems have not been constructed, individual septic tank systems are used to dispose of domestic wastes. As the population in these areas grows, the density of septic tanks typically increases. This threatens water quality by placing increasing demands on the environment's natural ability to dissipate the pollutants created.

Septic tank densities in Cache Valley currently range from 26 to 145 acres per septic system for the designated communities. The countywide average is 72 acres per septic system.³ Septic tank densities are a significant concern in Cache Valley and could soon become a problem elsewhere in the basin. Septic tanks for summer home developments are also a concern, as they are commonly located in sensitive watershed areas. Unless alternative wastewater treatment systems are built, there may be restrictions placed on future development in these areas in the form of septic tank density regulations.

Water Quality Protection and Improvement Programs in Utah

Many state and federal programs are in place to improve the nation's and Utah's water quality. The Utah Pollutant Discharge Elimination System (UPDES) closely regulates point sources of pollution. This system has brought about significant improvement to water quality over the past 30 years and continues to play a valuable role. The Division of Water Quality is currently preparing a Non-point Source Pollution Plan to better handle non-point sources of pollution, which are believed to be responsible for 95 percent of the state's remaining water quality impairments. The division will

integrate this plan with the TMDL requirements using a watershed-based approach. This approach seeks the participation and involvement of local stakeholders.

The Utah Division of Drinking Water is responsible for protecting Utah's drinking water sources. To accomplish this task, the division has implemented a drinking water source protection program that provides valuable guidelines and rules to help communities protect their water sources.

A Tri-State Water Quality Task Force has been established to plan and implement water quality improvement projects. This task force consists of representatives from the Department of Environmental Quality for each of the three states along with representatives from Idaho Fish and Game, Utah Division of Wildlife Resources, Wyoming Fish and Game, U.S. Fish and Wildlife Service, Utah Division of Water Resources, Utah Division of Water Rights, U.S. Natural Resources Conservation Service, PacifiCorp Power Company, Bear River Water User's Association, U.S. Forest Service, U.S. Environmental Protection Agency, U.S. Department of Agriculture, and other local interest groups. This task force meets quarterly and is currently working to insure that the TMDL process and water quality standards are consistent throughout the Bear River Basin and particularly across state boundaries. The task force has sponsored and continues to sponsor water quality projects within the basin.

THE ENVIRONMENT

Endangered Species

The U.S. Fish and Wildlife Service (FWS) has jurisdictional responsibility over wildlife issues with national implication, such as migratory birds or threatened and endangered species. The FWS administers and operates the Bear River Migratory Bird Refuge at the mouth of the Bear River in Box Elder County.

Table 20 lists the species considered threatened or endangered which reside in the Bear River Basin. The list changes over time as various species are added when they become threatened or removed from the list as they recover. When any activity is

TABLE 20
Threatened and Endangered Species
Bear River Basin

Gray Wolf	*endangered
Whooping Crane	endangered
Black-footed Ferret - Unconfirmed	*endangered
Lahontan Cutthroat Trout	threatened
Bald Eagle	threatened
Maguire Primrose	threatened
Brown Grizzly Bear	*threatened
Canada Lynx - Possible	threatened
Fat-whorled Pondsnaill	candidate
Yellow-billed Cuckoo	candidate
*Considered by U.S. Fish and Wildlife Service to no longer occur in Utah.	

planned which may impact a threatened or endangered species, it is the responsibility of the project sponsor to take actions to protect them.

The FWS compiles lists of native animal and plant species for review and possible addition to the list of threatened and endangered species. Such species are generally referred to as candidates. While these species presently have no legal protection under the Endangered Species Act, it is prudent to consider impacts to these species as well. From a planning perspective, it is prudent to consider the possibility that a candidate species could, in the near future be added to the list of threatened and endangered species. The candidate species listed for the Bear River Basin are the Fat-whorled Pondsnaill and the Yellow-billed Cuckoo.

Wetlands

Wetlands are among the most biologically productive natural ecosystems in the world. Wetlands provide many benefits to the people of Utah; they provide natural flood protection, improve water quality, assist in storm water management, and afford unique opportunities for recreation, education and research. In addition, they provide many benefits to wildlife species.

The Wetlands definition currently accepted by the Corp of Engineers and the EPA is found in the 1987 Corp of Engineers Wetlands Delineation Manual. Under these guidelines, three criteria must be met to define an area as a wetland: (1)



Wetlands adjacent Cutler Reservoir

hydrophytic vegetation; (2) hydric soils; and (3) wetland hydrology. Wetlands are defined as:

"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."⁴

Instream Flow Maintenance

Over the past several decades, instream flow maintenance has had more and more of an effect on water resources development and management. The advantages of maintaining year-round minimum flows in natural streams in the Bear River Basin are: (1) protection of existing fish populations; (2) maintenance of riparian vegetation, for stream bank stability and resistance to erosion; (3) maintenance of favorable conditions of flow in stream channels; (4) esthetic enjoyment and recreational use by people; and (5) normal daily use by birds, animals and aquatic organisms and plants.

Releases from Bear Lake for irrigators in Box Elder County have helped to insure instream flows for much of the main stem of the Bear River through the late summer season and early fall. Many of the Bear River's tributary streams, however, are dewatered through this period as flows are diverted for irrigation of farmland.

The ability to obtain instream water rights in Utah lies exclusively with the Division of Wildlife

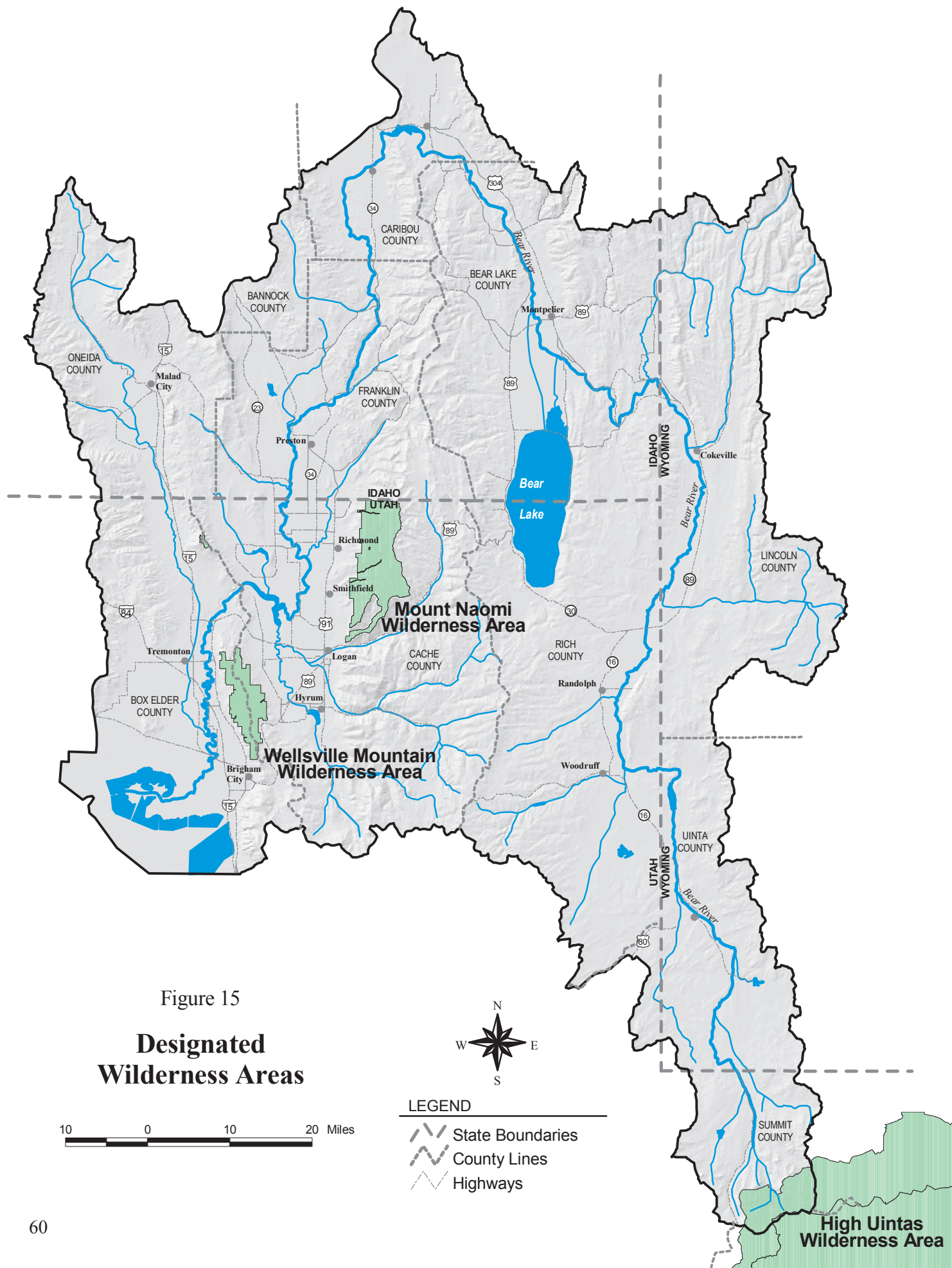
Resources and the Division of Parks and Recreation. The Utah Code allows these two state agencies to file changes on perfected water rights in order to provide instream flows in designated reaches of streams. These flows may be acquired for preservation and enhancement of fisheries, the natural stream environment, or public recreation. Acquisition of such water rights is dependent upon legislative appropriations and a willing seller, unless the water right is previously owned by the agency or is gifted or deeded to it.

The Utah Code also authorizes the State Engineer to reject an application to appropriate water or to change use of a water right if, in the State Engineer's judgment, approval would unreasonably affect public recreation or the environment by decreasing instream flows. In this sense, an instream water right is not the only way that instream flows can be protected. In addition to actual instream water rights, numerous instream flow requirements exist around the state. These minimum flows are typically part of an agreed project operation or permit requirement.

Wilderness Designation

Wilderness designation of Utah lands has been the subject of heated debate since the early 1980s. Wilderness proponents have concluded that a significant portion of federal lands in the state qualify for designation as wilderness. State and local leaders are deeply concerned by the potential impacts that such broad-sweeping designations will have on state and local resources.

Wilderness is believed by many to be the most restrictive federal land management designation. As such, development within these areas becomes very difficult, if not impossible. Use of existing water supplies and facilities would also be restricted to prior uses, thus prohibiting some changes or upgrades needed to meet future needs. Access for maintenance would also be restricted. Careful consideration of all impacts should be made before designating areas as wilderness or wilderness study areas. Current and potential uses of water needs must be considered when evaluating the impact of wilderness designation. Lands currently designated as wilderness within the Bear River Basin are identified in figure 15.



Wild and Scenic River Designation

The Wild and Scenic Rivers Act (WSRA) of 1968 states that, "certain selected rivers of the nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." Designation of a stream or river segment as "wild and scenic" would prevent construction of flow modifying structures or other facilities on such river segments. The area for which development is limited along a wild and scenic river varies from river to river, but includes at least the area within one-quarter mile of the ordinary high water mark on either side of the river.

Currently there are no rivers in the Bear River Basin with the Wild and Scenic River designation. In recent years, however, national forests and other federal agencies have made inventories of Utah streams for consideration as wild and scenic rivers.

Land Management and Water Yield

The federal government, primarily the U.S. Forest Service and the Bureau of Land Management, administers about two-thirds of the land area in the state of Utah. More significantly, these federal agencies own and manage the headwaters of almost all the watersheds from which the state's surface water supply is derived and the state's population is dependent. Utah is concerned about the ability of these lands to yield a high quality, non-declining supply of water to its communities for agricultural, M&I, and other uses.

Since the 1920s, federal agencies have been very successful in suppressing natural fire. Consequently, there has been a buildup in standing vegetation (biomass) on these lands. Federal agencies should practice responsible watershed management that will help ensure a continued high quality, non-declining supply of water to meet the state's increasing needs.

NOTES

1 Geology of Northern Utah: Utah Geological Association Publication 27, Utah Geological Survey, US Geological Survey, Rocky Mountain Foundation, American Association of Petroleum Geologists, (September 11, 1999).

2 Utah State Department of Environmental Quality Web Page:
waterquality.utah.gov/watersheds/bear/water_quality.htm

3 Ground-Water Quality Classification and Recommended Septic Tank Soil-Absorption-System Density Maps, Cache Valley Utah, by Mike Lowe, Janae Wallace, and Charles E. Bishop, Environmental Sciences Program, Utah Geologic Survey (June, 2002)

4 U.S. Army Corps of Engineers, 1987. Wetlands Delineation Manual, Environmental Laboratory, Department of Army, Waterways Experiment Station, Corps of Engineers,

Vicksburg, Mississippi, p. 13.